

**SAMPLING AND ANALYSIS PLAN
FOR
BARNUM ORCHARD
TARGETED BROWNFIELDS ASSESSMENT
DENVER, COLORADO**

Prepared for
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 8

Prepared by
WESTON SOLUTIONS, INC.
Region 8 Superfund Technical Assessment and Response Team

August 2015

For approval signatures, see Worksheet 1 & 2.

Project Dates of Sampling:	August 2015
Site Spill Identifier No.:	Not Applicable
Contract Name:	START IV
Contract No.:	EP-S8-13-01
Technical Direction Document No.:	1508-03
Document Control No.:	W0266.1E.00547

SAP Revision Log

Site: Barnum Orchard
WAM: Ted Lanzano
TDD: 1508-03

Date	Revision Number	Reason for Change of Scope/Procedures	SAP Section Superseded	Requested By	Approved By

TDD 0003/1504-06

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List of Acronyms

Bgs	below ground surface
CA	Corrective Action
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPR	cardiopulmonary resuscitation
DAO	Delegated Approval Officer
DQO	Data Quality Objective
DU	Denver University
E.I.T.	Engineer in Training
EDD	electronic data deliverable
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
FS	feasibility study
ft	feet
GPS	Global Positioning System
HASP	Health and Safety Plan
HEPA	high efficiency particulate air
HUD	U.S. Department of Housing and Urban Development
in	inch
LDL	Laboratory Detection Limit
LEED AP	Leadership in Energy and Environmental Design Accredited Professional
LTE	Lone Tree Elementary
LQL	Laboratory Quantitation Limit
MPC	Measurement Performance Criteria
MS	matrix spike
MSD	matrix spike duplicate
N/A	Not Applicable
OSHA	Occupational Health and Safety Administration
PAL	Project Action Limit
P.G.	Professional Geologist
PM	Project Manager
PQL	Project Quantitation Limit
PPE	Personal Protective Equipment
PT	proficiency testing
PTL	Project Team Lead
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
REC	recognized environmental conditions
SAP	Sampling and Analysis Plan
SDDENR	South Dakota Department of Environment and Natural Resources
SOP	Standard Operating Procedure
START	Superfund Technical Assessment and Response Team
SVOC	semi-volatile organic compounds
TAL	Target Analyte List

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List of Acronyms (continued)

TAT	turnaround time
TBA	Targeted Brownfields Assessment
TDD	Technical Direction Document
TPH	total petroleum hydrocarbons
TSI	thermal system insulation
UFP	Uniform Federal Policy
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compounds
WAM	Work Assignment Manager
WESTON	Weston Solutions, Inc.

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Attachment B	TBA Application

Introduction

This Sampling and Analysis Plan (SAP) identifies the data collection activities and associated quality assurance/quality control (QA/QC) measures for the Barnum Orchard property located at 101 King St in Denver, Colorado.

Sampling will only be conducted at specific garden locations, not the entire property. This SAP has been prepared as part of the Phase II Environmental Site Assessment (ESA) activities for the site. All Phase II ESA activities presented in this SAP will be conducted in accordance with ASTM E1903-11 *Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process*.

All data will be generated in accordance with the quality requirements described in the Quality Assurance Project Plan (QAPP) for Region 8 Targeted Brownfields Assessment (Weston Solutions, Inc. [WESTON], 2013 – Last Revised 2015). The purpose of this SAP is to describe site-specific tasks that will be performed in support of the stated objectives. This SAP will reference the QAPP for tasks common to all data collection activities including routine procedures for sampling and analysis, sample documentation, equipment decontamination, sample handling, data management, assessment, and data review. Additional site-specific procedures and/or modifications to procedures described in the QAPP are described in the following SAP elements.

This SAP is prepared, reviewed, and approved in accordance with the procedures detailed in the QAPP. Any deviations or modifications to the approved SAP will be documented using the SAP Revision Form. This SAP is produced in accordance with the Uniform Federal Policy (UFP) for QAPPs and consists of the site-specific UFP Worksheets from the QAPP.

Refer to the Worksheet 3 & 5, and 4, 7, & 8 in this SAP document and the QAPP for an organizational chart, communication pathways, personnel responsibilities and qualifications, and special personnel training requirements.

Project Organization and Team

Refer to the QAPP Worksheet 3 & 5, and 4, 7, & 8 for the program organizational chart, communication pathways, personnel responsibilities and qualifications, and special personnel training requirements. The following are key individuals identified for this project:

Name	Title/Role	Organization	Receive Copy of SAP?
Mark Blanchard	Project Manager	START	Yes
Ted Lanzano	Work Assignment Manager	EPA	Yes
Wendy Lu McGill	Community Garden Representative	Barnum Community Garden	Yes
Charles Partridge	Toxicologist	EPA	Yes
Molly Patterson	Project Scientist	START	Yes
Jessica Romer	Horticulturist	DUG	Yes
Roy Weindorf	Project Team Lead	START	Yes
Chris Yanez	West Denver Park Planner	City and County of Denver	Yes

The individuals who will receive a copy of the Program QAPP are specified on QAPP Worksheet 3 & 5

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(Project Organization and QAPP Distribution) as noted by the asterisk symbol adjacent to their names. The program QA Manager (QAPP Worksheet 4, 7 & 8) and the Project Manager will maintain the approved QA project plan consisting of the Program QAPP, Project SAP and SAP Document Review Crosswalk. The PTL will distribute the most current copy of the project QA documents via electronic or hard copy, as directed by the WAM.

The UFP Worksheet Summary Table below lists the QAPP Worksheets relevant to this SAP, and location in the SAP or QAPP.

UFP Worksheet Summary

Worksheet #	Worksheet Title	Relevant for Project (Y/N)	Included in SAP	Included in QAPP
1 & 2	Title and Approval Page	Y	X	
3 & 5	Project Organization and QAPP Distribution	Y	X (project team)	X (mgmt level)
4, 7, & 8	Personnel Qualifications and Sign-off Sheet	Y	X	
6	Communication Pathways	Y		X
9	Project Planning Session Summary	Y	X	
10	Conceptual Site Model	Y	X	
11	Project/Data Quality Objectives	Y	X	
12	Measurement Performance Criteria Tables	Y		X
13	Secondary Data Uses and Limitations	Y		X
14 & 16	Project Tasks & Schedule	Y	X	
15	Project Action Limits and Laboratory-Specific Detection/Quantitation Limits	Y	X	
17	Sampling Design and Rationale	Y	X	
18	Sampling Locations and Methods	Y	X	
19 & 30	Sample Containers, Preservation, and Hold Times	Y		X
20	Field Quality Control Sample Summary	Y	X	
21	Field SOPs	Y	X	
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	Y		X
23	Analytical SOPs	Y		X
24	Analytical Instrument Calibration	Y		X
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	Y		X
26 & 27	Sample Handling, Custody, and Disposal	Y	X	
28	Analytical Quality Control and Corrective Action	Y		X
29	Project Documents and Records	Y		X
31, 32 & 33	Assessments and Corrective Action	Y		X
34	Data Verification and Validation Inputs	Y		X
35	Data Verification Procedures	Y		X
36	Data Validation Procedures	Y	X	
37	Data Usability Assessment	Y		X

QAPP Reference

Weston Solutions, Inc. 2013. Quality Assurance Project Plan for Region 8 Targeted Brownfields Assessment. Prepared for the START IV Contract. July 2013, Last revised 2015.

Worksheet 1 & 2 — Title and Approval Page

(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

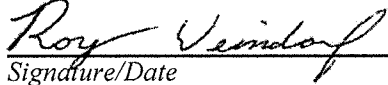
1. Project Identifying Information

- a) **Site Name/Project Name:** Barnum Orchard
- b) **Site Location/Number:** 101 King St, Denver, Denver County, Colorado
- c) **Contract/Work Assignment Number:** EP-S8-13-01/Technical Direction Document (TDD)
0003-1508-03


- 2) **List Plans and reports from previous investigation relevant to this project.**
Not Applicable (N/A)

The undersigned approves the entire UFP-QAPP document which includes this SAP and other elements that are found in the Region 8 Brownfields Program QAPP.


**Lead Investigative Organization's Project
Team Leader:**

Roy Weindorf/START
Printed Name/Title
 8/28/2015
Signature/Date

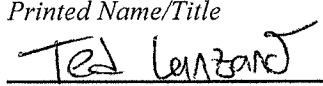
**Lead Investigative Organization's Technical
Manager:**

Mark Blanchard, P.G./START
Printed Name/Title
 8/28/2015
Signature/Date

**Lead Investigative Organization's Quality
Manager:**

Tana Jones/START
Printed Name/Title
 8/28/2015
Signature/Date

**Federal Regulatory Agency Work Assignment
Manager/Delegated Approval Officer:**

Ted Lanzano/Brownfields Project Manager
Printed Name/Title
 9/9/15
Signature/Date

Document Control Numbering System:

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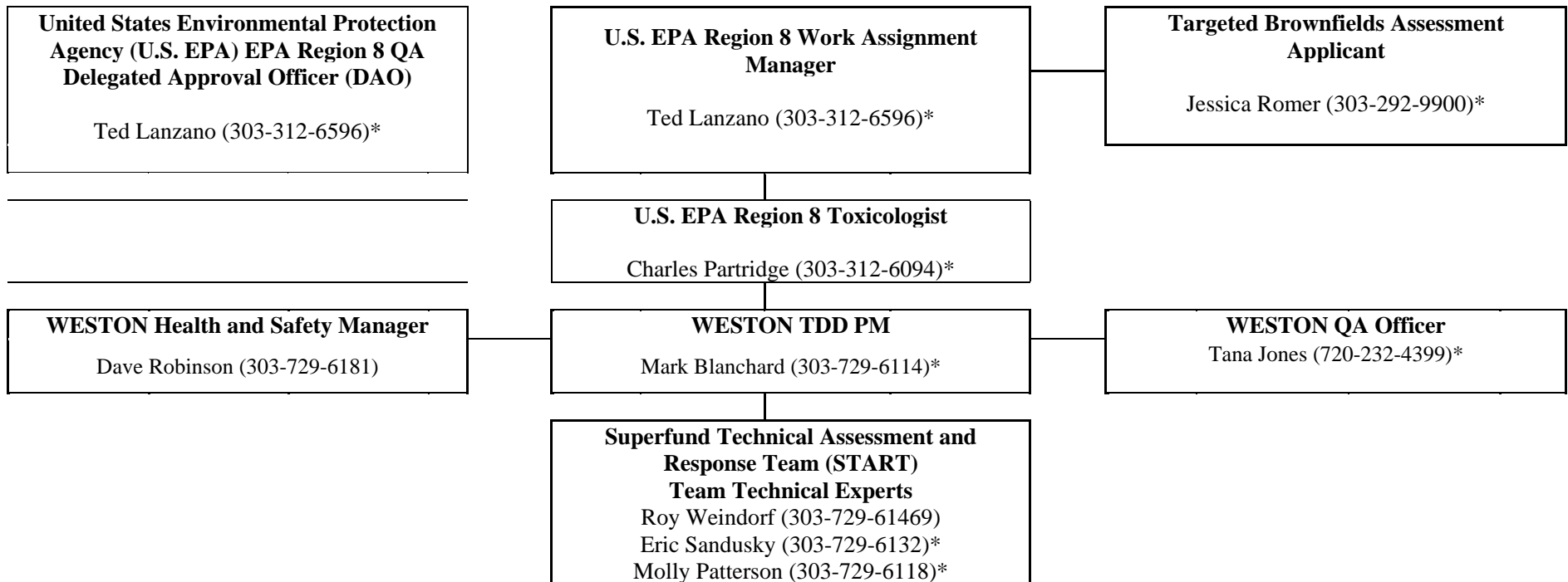
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Worksheet 3 & 5 — Project Organization and QAPP Distribution

(UFP-QAPP Manual Section 2.3 and 2.4)

(EPA 2106-G-05 Section 2.2.3 and 2.2.4)

Project SAP Organization and Distribution



* shall receive a copy of the Project SAP

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Worksheet 4, 7 & 8 — Personnel Qualifications and Sign-off Sheet

(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)

(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

Organization: START					
Name	Project Title / Role	Education / Experience	Specialized Training / Certifications ¹	Training Provider ²	Signature / Date
Mark Blanchard, P.G., LEED® AP	PM / Operational POC for project level communications with U.S. EPA Site Assessment Managers (SAMs), ensure performance associated with the contract, coordinate and communicate with U.S. EPA in the pre-planning phase of individual TDD assignments, provide technical direction to PTL, and support any functions delegated by the Program Manager.	B.S., Geology, M.S. Geology, M.A.S., Environmental Policy / Over 20 years' project management experience conducting site assessments, feasibility studies (FSs), and remedial design activities at Resource Conservation and Recovery Act (RCRA) / Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites.	40-Hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Site Worker Training; 8-Hour OSHA Refresher Training; First Aid and cardiopulmonary resuscitation (CPR); Federal Emergency Management Agency (FEMA) IS Levels 100, 200, 300, 400, 700, and 800; Understanding Migration, Assessment, and Remediation of Non-aqueous Phase Liquids; Professional Geologist (P.G.) in Utah, Texas, and Nebraska; Leadership in Energy and Environmental Design Accredited Professional (LEED® AP).	WESTON, Registered Training Organization – Various	
Roy Weindorf, P.G.	PTL / Supervises field sampling and coordinate all field activities. Ensures all training/certifications are satisfied for field team personnel.	B.S. Geology and Education / 9 + years project experience including conducting site assessments, Phase I/II ESAs, and site management	40-Hour OSHA Hazardous Waste Site Worker Training; 8-Hour OSHA Refresher Training; First Aid and CPR; FEMA) IS Levels 100, 200, 700, and 800	WESTON, Registered Training Organization – Various	
Eric Sandusky	Field Personnel / Assists with field sampling and documentation of field activities.	B.A. Geology and Education / 6 + years project experience including conducting site assessments, Phase I/II ESAs, and site management	40-Hour OSHA Hazardous Waste Site Worker Training; First Aid and CPR	WESTON, Registered Training Organization – Various	
Molly Patterson	Field Personnel / Assists with field sampling and documentation of field activities.	B.S. Biology / 4+ years project experience including emergency response management, conducting site assessments, and water/soil sampling.	40-Hour OSHA Hazardous Waste Site Worker Training; First Aid and CPR, Federal Emergency Management Agency (FEMA) IS Levels 100, 200, 300, 400, 700, and 800	WESTON, Registered Training Organization – Various	

¹ Training records and/or certificates are on file at the Weston Solutions, Inc., West Chester, Pennsylvania office and are available upon request.

² Training provider and date of training will vary from person to person due to individual scheduling of training.

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Worksheet 9 — Project Planning Session Summary

(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)

(EPA 2106-G-05 Section 2.2.5)

Date of Planning Session: 8/11/2015				
Location: Site walk				
Purpose: Scoping meeting for Barnum Orchard				
Name	Title/Role	Organization	Phone No.	E-mail Address
Ted Lanzano	WAM	EPA	303-312-6596	Lanzano.Ted@epa.gov
Michael	Intern	EPA		
Jessica Romer	TBA Applicant	Director of Horticulture	303-292-9900	jessica@dug.org
Mark Blanchard	Project Manager	START	303-729-6114	m.blanchard@westonsolutions.com

Notes/Comments:

- Site walk was held on 8/11/2015
- There will be three main components
 - Perimeter area that will be planted with fruit bearing hedges
 - Interior area (comprising most of the garden) that will be planted with fruit bearing trees
 - Drain area that will be planted with asparagus
- Grab and composite sampling will be conducted with hand sampling tools

Consensus Decisions Made:

- Analysis includes VOCs, SVOCs, Pesticides, and TAL Metals.
- Sampling approach
 - Perimeter – 15 point composite
 - Interior – 30 point composite
 - Drain area – 5 point composite plus 2-4 grab samples for VOCs
- Sampling depths
 - 0 – 2 inches
 - 2 – 6 inches
 - 6 – 8 inches
- Target completing sampling the last week of August.
- START will prepare a Draft Sampling and Analysis Plan and submit it for review by EPA and DUG

Action Items:

Action	Responsible Party	Due Date
Prepare Draft SAP	START	8/21/2015

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Worksheet 10 — Conceptual Site Model

(UFP-QAPP Manual Section 2.5.2)

(EPA 2106-G-05 Section 2.2.5)

Problem Definition:

Denver Urban Gardens (DUG) is assisting Denver Parks and Recreation and the Barnum neighborhood to redevelop the property at 101 King St, Denver, CO into a community orchard. The orchard will primarily consist of fruit trees and a berry garden for the Barnum neighborhood.

An environmental assessment of the site is needed to ensure the community orchard is a suitable reuse. A summary of the site walk/scoping meeting for this SAP is provided in Worksheet 9.

Background Information/Site History:

The site has been vacant since the City of Denver Parks and Recreation acquired it in the 1930's, and potentially beforehand as well. The open channel of Weir Gulch previously ran down the middle of the property. At some point, a storm sewer pipe system was installed on the eastern edge of the property and the channel was filled and covered. The fill dirt is from unknown origins.

Barnum Orchard will be a fruit orchard and berry garden for the Barnum neighborhood community. It is located adjacent to the Lowell Street Community Garden, a well-established food-producing DUG site that was established in 1997. The garden will be filled with apple, peach, plum, cherry and pear trees, with raspberries, strawberries, blackberries, and blueberries growing beneath the trees, all grown by volunteers and open to the community to eat and harvest. Produce not taken by the community will be harvested and donated to food banks. Future plans could include education workshops taught at the garden site by Master Gardeners to show how to grow similar trees and plants in home gardens.

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Worksheet 11 — Project/Data Quality Objectives

(UFP-QAPP Manual Section 2.6.1)

(EPA 2106-G-05 Section 2.2.6)

11.1. State the Problem

The property owner and the community garden organization are concerned about potential environmental contamination from and unknown fill material and overall uncertainty about the past use of the site. The potential for environmental contamination has complicated the reuse of the site as an orchard. An environmental assessment is needed to demystify the environmental condition of the property and facilitate the reuse. Identify the Goals of the Study

- Assess and evaluate potential impacts to both surface soil and subsurface soil by suspected contaminants including volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), Target Analyte List (TAL) metals and pesticides that are potentially present at all three properties;
- Assess and evaluate potential impacts to both surface soil and subsurface soil by pH values that can impact soil nutrients for gardening at all three properties;
- Develop sufficient information to reasonably render a professional opinion that, with respect to the potential concerns noted above, hazardous substances either are or are not present at any of the three properties, including the concentrations of the substances if present;
- Gather and provide sufficient data to assist the TBA recipients in making informed decisions with regard to the future use of the three properties; and
- Gather sufficient data to provide cleanup options and associated cost estimates if needed at any of the three sites.

Specific decision statements to support these goals are:

- Are TAL metals present in the soils at the Sites? If so, at what locations and depths? What are the concentrations indicated by laboratory analysis?
- Are pesticides present in the soils at the Sites? If so, at what locations and depths? What are the concentrations indicated by laboratory analysis?
- Are VOCs or SVOCs present in the soils? If so, at what locations and depths? What are the concentrations indicated by laboratory analysis?
- What is the pH of the soils at the Sites? Is it impacting soil nutrients? If so at what locations? What are the levels indicated by laboratory analysis?
- Is redevelopment of these properties for use as community gardens a viable alternative based upon the type and amount(s) of contamination present, if any?

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11.2. Identify Information Inputs

Historic information indicates the possibility of environmental concerns existing on the property. To assess the feasibility of redevelopment planning, a determination will be made as to whether gardens are a suitable use and if cleanup is required.

Samples for laboratory analyses and/or surveys for identification of TAL metals, pesticides, pH, and VOC's/SVOC's will be completed throughout the area as designated by the WAM (Figure 1).

The following depth intervals will be sampled:

- 0 to 2 inches
- 2 to 6 inches
- 6 to 18 inches

Two types of sampling will take place on this project: grab and composite.

Location	Sampling Type	Description	Sample Quantity	Analytes
Northeast Perimeter	Composite	15 locations at three depth intervals.	3 samples (1 from each of three depth intervals)	Metals, SVOCs, pesticides, pH
Interior	Composite	30 locations at three depth intervals.	3 samples (1 from each of three depth intervals)	Metals, SVOCs, pesticides, pH
Drain area	Composite	5 locations at three depth intervals.	3 samples (1 from each of three depth intervals)	Metals, SVOCs, pesticides, pH
Around storm drain	Grab	2-4 locations at single depth	2-4 samples	VOC's, SVOC's

For the purposes of this project, soil samples will be compared against EPA Residential Regional Screening Levels (RSL's).

If contaminants are detected at the property at levels below applicable benchmarks for those contaminants, then the redevelopment project can proceed. If contaminants are present at the property at levels equal to or greater than applicable benchmarks, garden plans may need to be reassessed.

Samples to be collected include:

- Northwest Perimeter Area
 - 1 composite surface sample with 1 aliquot each 0-2 inches from 15 locations
 - 1 composite subsurface sample with 1 aliquot each 2-6 inches from 15 locations
 - 1 composite subsurface sample with 1 aliquot each 6-18 inches from 15

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- locations
- Interior Area
 - 1 composite surface sample with 1 aliquot each 0-2 inches from 30 locations
 - 1 composite subsurface sample with 1 aliquot each 2-6 inches from 30 locations
 - 1 composite subsurface sample with 1 aliquot each 6-18 inches from 30 locations
- locations
- Drain Area
 - 1 composite surface sample with 1 aliquot each 0-2 inches from 5 locations
 - 1 composite subsurface sample with 1 aliquot each 2-6 inches from 5 locations
 - 1 composite subsurface sample with 1 aliquot each 6-18 inches from 5 locations
 - 2-4 grab surface samples surrounding the storm drain

11.4. Define the Boundaries of the Study

Spatial and temporal aspects of the environmental assessment include:

Spatial boundary of the decision statement:

The assessment area for the site is approximately 0.2 acres. Surface soil will be defined as 0 to 2 inches below ground surface (bgs). Subsurface soil will be defined as 2 to 18 inches bgs. Sample locations are within the planned orchard area.

Temporal limit and scale of inference of the decision statement:

A sampling schedule and sampling plan to include the media to be collected are included as Worksheet 14 & 16 and Worksheet 17. Field activities are expected to occur in August 2015.

Practical constraints on data collection:

Site entry will be limited by site access agreements with the site owner. Field constraints may include equipment and sampling limitations due to weather conditions. If weather constraints pose a problem to the sampling schedule, START will coordinate with the WAM to adjust the schedule as necessary. Scheduling adjustments will be made if physical constraints on planned field events occur. Any deviations to the sampling plan will be recorded in the project logbook. If any areas are determined to be too hazardous to access for sampling the location will be recorded in the field logbook and no sample collected.

11.5. Develop the Analytic Approach

See Worksheet 17 - Sampling Design and Rational – for a detailed discussion of the sampling approach.

Regulatory screening levels will be the U.S. EPA Residential RSLs for soil. Analytical results for each media sampled will be compared to the applicable regulatory criteria as listed in Worksheet 15.

If contaminants are present at the property at levels equal to or greater than applicable benchmarks, further evaluation may be needed to further characterize the extent of the contamination, and garden plans may need to be reassessed. Based upon the results of the assessment, START will identify the hazards presented by the contaminants and options for cleanup of the contaminants for property redevelopment.

11.6. Specify Performance or Acceptance Criteria

Sampling design and rationale are provided in Worksheet 17. Sampling error will be limited to the extent practicable by following approved U.S. EPA methods and applicable SOPs listed in Worksheet #21. Sampling error and tolerable limits cannot be quantified.

Composite sampling will be employed in the perimeter, interior and drain areas. Grab samples at depth will be employed adjacent to the storm drain. Biased sampling will be used at locations where vegetation intended for human consumption will be planted and at locations representative of areas that will be accessible to the public and workers. Use of biased sampling points such as potential suspect materials precludes statistical determination of limits on decision errors. Measurement error, rather than sampling error, is deemed the primary factor affecting any decision error. Verified, definitive data will be required to evaluate measurement error. Sampling error will be limited to the extent practicable by following approved EPA methods and applicable SOPs as listed in Worksheet 21. Sampling error and tolerable limits cannot be quantified.

11.7. Develop the Detailed Plan for Obtaining Data

As stated above, data will be collected per the sampling design and rationale provided in Worksheet 17. Sample nomenclature is described in Worksheet 17 (Identification and Handling). Sample descriptions will be logged in the field logbook using standard geologic descriptions.

Worksheet 14 & 16 —Project Tasks & Schedule

(UFP-QAPP Manual Section 2.8.2)

(EPA 2106-G-05 Section 2.2.4)

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Develop a Draft SAP and the U.S. EPA Region 8 QA Document Review Crosswalk	START	8/12/2015	8/21/2015	Draft SAP and the Draft U.S. EPA Region 8 QA Document Review Crosswalk	8/21/2015
U.S. EPA and TBA Recipient Review of Draft SAP	U.S. EPA and TBA Recipient	Upon receipt of Draft SAP	8/26/2015	Comments on Draft SAP	N/A
Address Comments/Develop Final SAP and U.S. EPA Region 8 QA Document Review Crosswalk	START	Upon receipt of Draft SAP Comments	8/28/2015	SAP and the Final U.S. EPA Region 8 QA Document Review Crosswalk	8/28/2015
Develop Health and Safety Plan (HASP)	START	8/24/2015	8/28/2015	HASP	N/A
Mobilization	START	Week of 8/31/2015	9/4/2015	N/A	N/A
Field Activities	START	Week of 8/31/2015	9/4/2015	Field Notes/ Daily Updates to WAM	6/5/2015
Analytical Tasks	START	9/8/2015	9/22/2015	Field Notes/Laboratory Reports	N/A
Data Verification and Validation	START	Upon receipt of analytical data	9/23/2015	Verification and Validation Summary	N/A
Develop Draft Phase II ESA Report with cost estimate for cleanup	START	9/8/2015	9/25/2015	Draft Report	9/25/2015

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Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
U.S. EPA and TBA Stakeholder Review of Draft Phase II ESA Report with cost estimate for cleanup	U.S. EPA and TBA Stakeholders	9/25/2015 Upon receipt of Draft report	9/29/2015	Comments on Draft report	N/A
Address comments / Develop Final Phase II ESA Report with cost estimate for cleanup	START	10/1/2015	10/2/2015	Final Report	10/2/2015
Submit Property Profile Form	START	10/12/2015	10/16/2015	Property Profile Form	10/16/2015

Note – All dates presented in the table are planned dates and are subject to change given uncertainties such as inclement weather, laboratory reporting, etc. that can affect actual completion of the tasks described.

Site access agreements will be managed by the U.S. EPA WAM.

Laboratory analytical services will be provided by a subcontracted laboratory. Laboratory result turnaround time (TAT) will be standard 10 business days.

All analytical data will undergo verification and validation by START as described in QAPP Worksheets 34-37.

Reports to management will be written and distributed in accordance with the QAPP Worksheet 6.

Worksheet 15 — Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

(UFP-QAPP Manual Sections 2.6.2.3 and Figure 15)

(EPA 2106-G-05 Section 2.2.6)

Matrix: Soil

Analytical Methods: EPA Method 6010, 6020, 8081

Concentration level (if applicable): All

Analyte	EPA RSL Residential Soil THQ 1.0	PAL Reference ¹	Project Quantitation Limit (PQL) Goal	Laboratory Quantitation Limit (LQL) ^{2, 3}	Laboratory Detection Limit (LDL) ^{2, 3}
	(mg/kg) Project Action Limit (PAL) ¹		Soil (mg/kg)	Soil (mg/kg)	Soil (mg/kg)
VOCs					
Dichlorodifluoromethane	87	EPA RSL Table	0.005	0.005	0.005
Chloromethane	110	EPA RSL Table	0.005	0.005	0.005
Bromomethane (Methyl bromide)	6.8	EPA RSL Table	0.005	0.005	0.005
Vinyl Chloride	0.059	EPA RSL Table	0.005	0.005	0.005
Chloroethane (Ethyl Chloride)	1400	EPA RSL Table	0.005	0.005	0.005
Trichlorofluoromethane	730	EPA RSL Table	0.005	0.005	0.005
Methylene chloride	57	EPA RSL Table	0.005	0.005	0.005
Acetone	61000	EPA RSL Table	0.01	0.01	0.01
Carbon Disulfide	770	EPA RSL Table	0.005	0.005	0.005
Methyl Acetate	78000	EPA RSL Table	0.005	0.005	0.005
Dichloroethylene, 1,1- (1,1-Dichloroethene) (DCE)	230	EPA RSL Table	0.005	0.005	0.005
Dichloroethane, 1,1-	3.6	EPA RSL Table	0.005	0.005	0.005
Trichloro-1,2,2-trifluoroethane, 1,1,2-	40000	EPA RSL Table	0.005	0.005	0.005
Bromochloromethane	150	EPA RSL Table	0.005	0.005	0.005
Dichloroethene, cis-1,2-	160	EPA RSL Table	0.005	0.005	0.005
Dichloroethene, trans-1,2-	1600	EPA RSL Table	0.005	0.005	0.005
Methyl tertiary-butyl ether (MTBE)	47	EPA RSL Table	0.005	0.005	0.005
Chloroform	0.32	EPA RSL Table	0.005	0.005	0.005
Dichloroethane, 1,2- (EDC or DCA)(1,2-DCE) (ethylene dichloride)	0.46	EPA RSL Table	0.005	0.005	0.005

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Analyte	EPA RSL Residential Soil THQ 1.0	PAL Reference ¹	Project Quantitation Limit (PQL) Goal	Laboratory Quantitation Limit (LQL) ^{2, 3}	Laboratory Detection Limit (LDL) ^{2, 3}
	(mg/kg) Project Action Limit (PAL) ¹		Soil (mg/kg)	Soil (mg/kg)	Soil (mg/kg)
Methyl ethyl ketone (2-Butanone)	27000	EPA RSL Table	0.005	0.005	0.005
Trichloroethane, 1,1,1- (1,1,1-TCA)	8100	EPA RSL Table	0.005	0.005	0.005
Cyclohexane	6500	EPA RSL Table	0.005	0.005	0.005
Carbon Tetrachloride	0.65	EPA RSL Table	0.005	0.005	0.005
Bromodichloromethane	0.29	EPA RSL Table	0.005	0.005	0.005
Dichloropropane, 1,2-	1.0	EPA RSL Table	0.005	0.005	0.005
Dichloropropene, cis-1,3-	--	EPA RSL Table	0.005	0.005	0.005
Trichloroethylene (Trichloroethene) (TCE)	0.94	EPA RSL Table	0.005	0.005	0.005
Methylcyclohexane	--	EPA RSL Table	0.005	0.005	0.005
Dibromochloromethane	0.73	EPA RSL Table	0.005	0.005	0.005
Trichloroethane, 1,1,2-	1.1	EPA RSL Table	0.005	0.005	0.005
Benzene	1.2	EPA RSL Table	0.005	0.005	0.005
Dichloropropene, trans-1,3-	--	EPA RSL Table	0.005	0.005	0.005
Isopropylbenzene (Cumene)	1900	EPA RSL Table	0.005	0.005	0.005
Tribromomethane (Bromoform)	19	EPA RSL Table	0.005	0.005	0.005
Methyl isobutyl ketone (Methyl-2-pentanone, 4-)	5300	EPA RSL Table	0.01	0.01	0.01
Hexanone, 2-	200	EPA RSL Table	0.01	0.01	0.01
Dibromoethane, 1,2- (EDB) (Ethylene Dibromide)	0.036	EPA RSL Table	0.005	0.005	0.005
Tetrachloroethylene (Tetrachloroethene) (PCE)	24	EPA RSL Table	0.005	0.005	0.005
Tetrachloroethane 1,1,2,2-	0.60	EPA RSL Table	0.005	0.005	0.005
Toluene	4900	EPA RSL Table	0.005	0.005	0.005
Chlorobenzene	280	EPA RSL Table	0.005	0.005	0.005
Ethylbenzene	5.8	EPA RSL Table	0.005	0.005	0.005
Styrene	6000	EPA RSL Table	0.005	0.005	0.005
Xylene, m-	550	EPA RSL Table	0.005	0.005	0.005
Xylene, o-	650	EPA RSL Table	0.005	0.005	0.005
Xylene, p-	560	EPA RSL Table	0.005	0.005	0.005
Dichlorobenzene, 1,3-	--	EPA RSL Table	0.005	0.005	0.005

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Analyte	EPA RSL Residential Soil THQ 1.0	PAL Reference ¹	Project Quantitation Limit (PQL) Goal	Laboratory Quantitation Limit (LQL) ^{2, 3}	Laboratory Detection Limit (LDL) ^{2, 3}
	(mg/kg) Project Action Limit (PAL) ¹		Soil (mg/kg)	Soil (mg/kg)	Soil (mg/kg)
Dichlorobenzene, 1,4-	2.6	EPA RSL Table	0.005	0.005	0.005
Dichlorobenzene, 1,2-	1800	EPA RSL Table	0.005	0.005	0.005
Dibromo-3-chloropropane, 1,2- (DBCP)	0.0053	EPA RSL Table	0.005	0.005	0.005
Trichlorobenzene, 1,2,4-	24	EPA RSL Table	0.005	0.005	0.005
Trichlorobenzene, 1,2,3-	49	EPA RSL Table	0.005	0.005	0.005
Dioxane 1,4-	5.3	EPA RSL Table	0.1	0.1	0.1
SVOCs					
Benzaldehyde	7800	EPA RSL Table	0.17	0.17	0.17
Phenol	19000	EPA RSL Table	0.17	0.17	0.17
Bis(2-chloroethyl)ether	0.23	EPA RSL Table	0.17	0.17	0.17
Chlorophenol, 2-	390	EPA RSL Table	0.17	0.17	0.17
Acetophenone	7800	EPA RSL Table	0.17	0.17	0.17
Cresol, o- (Methylphenol, 2-)	3200	EPA RSL Table	0.17	0.17	0.17
Bis(2-chloroisopropyl) ether H (see also CAS 108-60-1)	4.9	EPA RSL Table	0.17	0.17	0.17
Cresol, p- (Methylphenol, 4-)	6300	EPA RSL Table	0.17	0.17	0.17
N-nitroso-di-n-propylamine (N-nitrosodipropylamine)	0.076	EPA RSL Table	0.17	0.17	0.17
Hexachloroethane	1.8	EPA RSL Table	0.17	0.17	0.17
Nitrobenzene	5.1	EPA RSL Table	0.17	0.17	0.17
Isophorone	570	EPA RSL Table	0.17	0.17	0.17
Nitrophenol, 2-	--	EPA RSL Table	0.17	0.17	0.17
Dimethylphenol, 2,4-	1300	EPA RSL Table	0.17	0.17	0.17
Bis(2-chloroethoxy)methane	190	EPA RSL Table	0.17	0.17	0.17
Dichlorophenol, 2,4-	190	EPA RSL Table	0.17	0.17	0.17
Chloroaniline, p- (4-chloroaniline)	2.7	EPA RSL Table	0.17	0.17	0.17
Hexachlorobutadiene	1.2	EPA RSL Table	0.17	0.17	0.17
Caprolactam	31000	EPA RSL Table	0.17	0.17	0.17
Chloro-3-methylphenol, 4-	6300	EPA RSL Table	0.17	0.17	0.17
Hexachlorocyclopentadiene	1.8	EPA RSL Table	0.17	0.17	0.17
Trichlorophenol, 2,4,6-	49	EPA RSL Table	0.17	0.17	0.17

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Analyte	EPA RSL Residential Soil THQ 1.0	PAL Reference ¹	Project Quantitation Limit (PQL) Goal	Laboratory Quantitation Limit (LQL) ^{2, 3}	Laboratory Detection Limit (LDL) ^{2, 3}
	(mg/kg) Project Action Limit (PAL) ¹		Soil (mg/kg)	Soil (mg/kg)	Soil (mg/kg)
Trichlorophenol, 2,4,5-	6300	EPA RSL Table	0.17	0.17	0.17
Biphenyl, 1,1'- (Biphenyl)	47	EPA RSL Table	0.17	0.17	0.17
Chloronaphthalene, 2- (chloronaphthalene-beta)	4800	EPA RSL Table	0.17	0.17	0.17
Nitroaniline, 2-	630	EPA RSL Table	0.33	0.33	0.33
Dimethylphthalate	--	EPA RSL Table	0.17	0.17	0.17
Dinitrotoluene, 2,6-	0.36	EPA RSL Table	0.17	0.17	0.17
Nitroaniline, 3-	--	EPA RSL Table	0.33	0.33	0.33
Dinitrophenol, 2,4-	130	EPA RSL Table	0.33	0.33	0.33
Nitrophenol, 4-	--	EPA RSL Table	0.33	0.33	0.33
Dibenzofuran	73	EPA RSL Table	0.17	0.17	0.17
Dinitrotoluene, 2,4-	1.7	EPA RSL Table	0.17	0.17	0.17
Diethylphthalate	51000	EPA RSL Table	0.17	0.17	0.17
Nitroaniline, 4- (Nitroaniline, p-)	27	EPA RSL Table	0.33	0.33	0.33
Chlorophenyl-phenyl ether, 4-	--	EPA RSL Table	0.17	0.17	0.17
Dinitro-2-methylephenol, 4,6 (Dinitro-o-cresol, 4,6)	5.1	EPA RSL Table	0.33	0.33	0.33
Nitrosodiphenylamine, N-	110	EPA RSL Table	0.17	0.17	0.17
Tetrachlorobenzene, 1,2,4,5-	23	EPA RSL Table	0.17	0.17	0.17
Bromophenyl-phenylether, 4- (p-Bromodiphenylether)	--	EPA RSL Table	0.17	0.17	0.17
Hexachlorobenzene	0.21	EPA RSL Table	0.17	0.17	0.17
Atrazine	2.4	EPA RSL Table	0.17	0.17	0.17
Carbazole	--	EPA RSL Table	0.17	0.17	0.17
Di-n-butylphthalate (Dibutylphthalate)	6300	EPA RSL Table	0.17	0.17	0.17
Butylbenzylphthalate	2900	EPA RSL Table	0.17	0.17	0.17
Dichlorobenzidine, 3,3-	1.2	EPA RSL Table	0.17	0.17	0.17
Bis(2-ethylhexyl)phthalate (DEHP)	39	EPA RSL Table	0.17	0.17	0.17
Di-n-octyl phthalate (Dioctylphthalate)	630	EPA RSL Table	0.17	0.17	0.17
Tetrachlorophenol, 2, 3, 4, 6-	1900	EPA RSL Table	0.17	0.17	0.17
PESTICIDES					

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Analyte	EPA RSL Residential Soil THQ 1.0	PAL Reference ¹	Project Quantitation Limit (PQL) Goal	Laboratory Quantitation Limit (LQL) ^{2, 3}	Laboratory Detection Limit (LDL) ^{2, 3}
	(mg/kg) Project Action Limit (PAL) ¹		Soil (mg/kg)	Soil (mg/kg)	Soil (mg/kg)
BHC, alpha-(Hexachlorocyclohexane, alpha)(alpha-HCH)	0.086	EPA RSL Table	0.0017	0.0017	0.0017
BHC, beta- (Hexachlorocyclohexane, beta) (beta-HCH)	0.30	EPA RSL Table	0.0017	0.0017	0.0017
BHC, delta-(Hexachlorocyclohexane, delta) (delta-HCH)	--	EPA RSL Table	0.0017	0.0017	0.0017
BHC, gamma- (Lindane) (gamma-HCH)	0.57	EPA RSL Table	0.0017	0.0017	0.0017
Heptachlor	0.13	EPA RSL Table	0.0017	0.0017	0.0017
Aldrin	0.039	EPA RSL Table	0.0017	0.0017	0.0017
Heptachlor epoxide	0.07	EPA RSL Table	0.0017	0.0017	0.0017
Endosulfan I	--	EPA RSL Table	0.0017	0.0017	0.0017
Dieldrin	0.034	EPA RSL Table	0.0033	0.0033	0.0033
DDE, 4,4'- (p,p--Dichlorodiphenyldichloroethylene)	2.0	EPA RSL Table	0.0033	0.0033	0.0033
Endrin	19	EPA RSL Table	0.0033	0.0033	0.0033
Endosulfan II	--	EPA RSL Table	0.0033	0.0033	0.0033
DDD, 4,4'- (p,p--Dichlorodiphenyldichloroethane)	2.3	EPA RSL Table	0.0033	0.0033	0.0033
Endosulfan sulfate	--	EPA RSL Table	0.0033	0.0033	0.0033
DDT, 4,4'- (p,p--Dichlorodiphenyltrichloroethane)	1.9	EPA RSL Table	0.0033	0.0033	0.0033
Methoxychlor	320	EPA RSL Table	0.017	0.017	0.017
Endrin ketone	--	EPA RSL Table	0.0033	0.0033	0.0033
Endrin aldehyde	--	EPA RSL Table	0.0033	0.0033	0.0033
Chlordane, alpha-	--	EPA RSL Table	0.0017	0.0017	0.0017
Chlordane, gamma-	--	EPA RSL Table	0.0017	0.0017	0.0017
Toxaphene	0.49	EPA RSL Table	0.17	0.17	0.17
Metals					
Aluminum	77000	EPA RSL Table	20	20	20
Antimony	31	EPA RSL Table	1.00	1.00	1.00
Arsenic	0.68	EPA RSL Table	0.50	0.50	0.50
Barium	15000	EPA RSL Table	5.00	5.00	5.00
Beryllium	160	EPA RSL Table	0.50	0.50	0.50
Cadmium	71	EPA RSL Table	0.50	0.50	0.50

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Analyte	EPA RSL Residential Soil THQ 1.0	PAL Reference ¹	Project Quantitation Limit (PQL) Goal	Laboratory Quantitation Limit (LQL) ^{2, 3}	Laboratory Detection Limit (LDL) ^{2, 3}
	(mg/kg) Project Action Limit (PAL) ¹		Soil (mg/kg)	Soil (mg/kg)	Soil (mg/kg)
Calcium	--	EPA RSL Table	500	500	500
Chromium	--	EPA RSL Table	1.00	1.00	1.00
Cobalt	23	EPA RSL Table	0.50	0.50	0.50
Copper	3100	EPA RSL Table	1.00	1.00	1.00
Iron	55000	EPA RSL Table	10	10	10
Lead	--	EPA RSL Table	0.50	0.50	0.50
Magnesium	--	EPA RSL Table	500	500	500
Manganese	1800	EPA RSL Table	0.50	0.50	0.50
Nickel	1500	EPA RSL Table	0.50	0.50	0.50
Potassium	--	EPA RSL Table	500	500	500
Selenium	390	EPA RSL Table	2.50	2.50	2.50
Silver	390	EPA RSL Table	0.50	0.50	0.50
Sodium	--	EPA RSL Table	500	500	500
Thallium	0.78	EPA RSL Table	0.5	0.5	0.5
Vanadium	390	EPA RSL Table	2.50	2.50	2.50
Zinc	23000	EPA RSL Table	1.00	1.00	1.00

-- No benchmark established

CAS - Chemical Abstract Service

EPA - U.S. Environmental Protection Agency

EPA RSL = U.S. EPA RSL, Residential Soil, June 2015. Available at: <http://www.epa.gov/region9/superfund/prg/>.

¹ Laboratories used will be either State certified for their specific cleanup program, or will be NELAP, NVLAP, or AIHA.

² Terminology is project/laboratory-specific.

³ As of August 20, 2015 a laboratory has not been selected for this project. The LQLs and LDLs listed are actual laboratory LQLs and LDLs from a past project in which these analyses have been conducted; however, the values listed are solely for reference purposes.

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Worksheet 17 — Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1)

(EPA 2106-G-05 Section 2.3.1)

START will review existing information and conduct sampling for analytical activities. This document summarizes the sample network design and rationale, including the numbers and types of samples to be collected, sampling locations, sampling frequencies, sample matrices, and measurement parameters. The Sampling Summary is provided on Table 1. The following table summarizes the matrices to be sampled and the rationale.

Environmental Concern	Description	Strategy	Outcome
VOCs, SVOCs, TAL Metals, Pesticides, pH	Previous and current uses of the site indicate a potential for presence of these contaminants.	Representative sampling of soil throughout site.	Laboratory analytical data quantifying impacts to representative surface and subsurface soil samples.

17.1 Schedule

Field work is anticipated for the last week of August, 2015. Sampling is estimated to be completed in approximately one day.

17.2 Safety

All field activities will be conducted in strict accordance with a START-approved Health and Safety Plan (HASP), which will be developed before the start of field activities. It is anticipated that all field work can be accomplished in Level D or Level C Personal Protective Equipment (PPE) equipment.

17.3 Property Access and Logistics

Access to the property will be provided by the TBA applicant and obtained by the WAM. START must have consent from all applicable property owners (on property and off-property) prior to the field sampling event.

17.4 Sample Locations

This TBA involves the collection of laboratory soil samples (Worksheet 11, 18 and Table 1). Sample points will be marked on an aerial photograph or site map after sample collection to be used for mapping purposes and to document sample locations selected in the field. If sampling locations become inaccessible, alternate sampling locations which provide adequate or sufficient data as the original will be identified and sampled based upon the best judgment of the inspector/sampler, if necessary.

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17.5 Sample Collection

17.5.1 Composite and Grab Soil Sampling

This procedure is followed to collect representative composite soil samples as well as representative grab samples. Both types will be collected according to ERT SOP #2012 and are described in the procedures outlined below:

1. Locate the identified sample location and record location on aerial photograph/site plan. If field conditions require the location to be adjusted, record new location in the field logbook.
2. Don a fresh pair of Nitrile gloves prior to collecting any samples. Carefully remove the top layer of soil or debris to the desired sample depth with a disposable scoop.
3. Each aliquot (or grab sample) will be collected using a disposable scoop (or shovel if the ground is too hard for the plastic scoop). Aliquots will consist of 2 or more scoops of soil, collected in equal amounts, from each location. The composite sample aliquots will be collected at a depth of 0 in. to 2 in., 2 in. to 6 in. bgs and 6 in. to 18 in. bgs, while minimizing disturbance of the soil to prevent volatilizing of any contaminants. The sample (composite or grab) will be placed in the appropriate sample container (Table 1). Obvious large items will be removed from the sample (e.g., rocks, twigs, visible soil clumps, and other debris).
4. Wipe sample container threads to ensure a tight seal and fasten container lid.
5. Label the laboratory sample container according to procedures outlined below and enter sample information on the laboratory COC form as described in Worksheet 21.

17.5.2 Sample Identification and Handling

Samples will be analyzed for the parameters listed in SAP Table 1. Requirements for the sample container, volume, preservation, and QC samples are included in Table 1.

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. A unique, identifiable name will be assigned to each sample to allow retrieval and sample cross referencing. The sample ID will be composed of the following three components:

[_]	[_]	[_]	[_]	[_]
1	2	3	4	5

Component 1 – Defines the Installation Identification:

BO – Barnum Orchard Garden

Component 2 – Defines sample type:

SO = Soil Sample

EB= Equipment Blank

Component 3 – Indicates the sample number (two digits)

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01 = the first sample collected

Component 4 – Indicates the depth at the top of the soil sample core

For example, 02= 2 inches bgs

Component 5 – Indicates the depth at the bottom of the soil sample core

For example, 06= 6 inches bgs

An example of a sample number is BOG-SO-03-06-18. This identifies the sample as soil sample (SO) number 3 taken from the 6-18 in. interval at the Barnum Orchard.

Samples will be recorded in a log book and located on a site map. If site conditions warrant the modification of nomenclature, this change will be documented in the logbook.

Field Duplicate samples will be identified with a separate, unique sample number following the above scheme. The field duplicate sample identification number will be documented in the field logbook.

Samples will be analyzed for the parameters listed in Table 1 and on Worksheet 15. Requirements for the sample container, volume, preservation, and QC samples are also listed in Table 1 and on Worksheet 19 & 30 of the QAPP.

17.6 Sampling Logistics and Contingencies

- Site Location and Weather Considerations

The TBA recipient has arranged site access. If the weather conditions are unsuitable for sampling, options to reschedule or delay the sampling until conditions improve will be assessed.

- Sampling Schedule Considerations

Samples will be tested and sent to the laboratory to meet the deadlines outlined in SAP Worksheet 14 & 16. Analytical methods identified do not include time critical sampling concerns with respect to preservatives, containers, or shipping.

- Sample Information Importance and Data Variability

The purpose of this sampling is outlined in SAP Worksheet 11.

Contaminants or other important sample considerations: None noted.

Data Variability: Data variability should be identifiable and minimized by documenting the locations and material types of sampling and field screening targets.

- Potential Sampling Problems and Corrective Action

In areas that disposable sampling scoops are not able to be used for soil sampling a decontaminated auger, shovel and/or pick will be used. Any changes from the planned equipment or methods will be documented in the field logbook.

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17.7 Data Management

Field data will be recorded in the field logbook. Proper chain-of-custody procedures will be utilized for documenting and tracking analytical samples. All data will be captured in the project files for use in analysis and reporting per QAPP Worksheet 29. Sample handling, custody and disposal responsibilities and methods are documented on SAP Worksheet 26 & 27. Other than chain-of-custody forms, no specific checklists or forms are required for this project.

Worksheet 18 — Sampling Locations and Methods

(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
 (EPA 2106-G-05 Sections 2.3.1 and 2.3.2)

Sampling Location / ID	Matrix	Depth (units)	Type	Analyte/Analytical Group	Sampling SOP Reference ¹	Comments
BO-SO-XX-00-02	Soil	0-2 in.	Composite	TAL Metals, Pesticides, pH	See Worksheet 21	
BO-SO-XX-02-06	Soil	2-6 in.	Composite	TAL Metals, Pesticides, pH	See Worksheet 21	
BO-SO-XX-06-18	Soil	6-18 in.	Composite	TAL Metals, Pesticides, pH	See Worksheet 21	
BO-SO-XX	Soil	0-6 in.	Grab	VOC's, SVOC's,	See Worksheet 21	

1 Sampling SOPs references provided in Worksheet 21.

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Worksheet 20 — Field Quality Control Sample Summary

(UFP-QAPP Manual Sections 3.1.1 and 3.1.2.)

(EPA 2106-G-05 Section 2.3.5)

Matrix	Sample Type	Analyte/ Analytical Group	No. of Field Samples	No. of Field Duplicates	No. of MS/MSD	No. of Field Blanks	No. of Equipment Blanks	No. of Trip Blanks	No. of Other	Total No. of Samples to Laboratory
Soil	Composite	TAL Metals, Pesticides, pH	9	1	1	0	0	0	0	10
	Grab	VOC's, SVOC's,	2-4	1	1	0	0	0	0	3-5

¹ Samples that are collected at different depths at the same location, and analyzed separately, will be counted as separate field samples. Even if they are taken from the same container as the parent field sample, MS/MSDs are counted separately, because they are analyzed separately. If composite samples are collected, only the sample that will be analyzed will be included; subsamples and increments will not be listed separately.

Field duplicates will be collected at a frequency of 1 per 10 samples. MS/MSD samples will be run at a frequency of 1 per 20 samples. Equipment blanks will be collected at a frequency of 1 per 20 samples if reusable equipment is being used.

Quality Assurance Assessment and CAs are found in QAPP Worksheet 28.

Worksheet 21 – Field SOPs

(UFP-QAPP Manual Section 3.1.2)

(EPA 2106-G-05 Section 2.3.2)

Field SOPs to be used at the Site are located in the QAPP Appendix G and include the following:

SOP Number or Reference	Title, Revision, Date, and URL (if available)	Originating Organization	SOP Option or Equipment Type (if SOP provides different options)	Modified for Project? Y/N	Comments
2006	Sampling Equipment Decontamination, 6/2011	U.S. EPA, Environmental Response Team (ERT)		N	
2012	Soil Sampling, 6/2011	U.S. EPA, ERT		N	
2049	IDW Management, 6/2011	U.S. EPA, ERT		N	
G-12	Specifications and Guidance for Contaminant-Free Sample Containers, 12/1992	U.S. EPA, Office of Solid Waste and Emergency Response		N	
2001	General Field Sampling Guidelines, 6/2011	U.S. EPA, ERT		N	

Environmental samples collected will adhere to the procedures described in the SOPs presented in QAPP Appendix H.

Investigation Derived Waste

For purposes of this SAP, investigation-derived wastes (IDW) are defined as any byproduct of the field activities that is suspected or known to be contaminated with hazardous substances. The performance of field activities will produce waste products, including spent sampling supplies (disposable scoops), expendable PPE (nitrile gloves), and decontamination fluids.

Handling of IDW will be performed according with ERT SOP #2049 as listed above as well as procedures described in *Management of Investigation Derived Wastes during Site Inspections (May 1991)*(QAPP Appendix J). Spent sampling supplies and expendable PPE are not anticipated to be considered a hazardous and will be containerized and disposed of in the municipal waste system.

Decontamination Procedures

General decontamination procedures are described in EPA ERT SOP #2006 Sampling Equipment Decontamination. Decontamination of sampling equipment must be conducted consistently to assure the quality of samples collected. All non-disposable sampling equipment that contacts potentially contaminated soil or water will be decontaminated. Materials to be stored more than a few hours will be covered.

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Worksheet 26 & 27 — Sample Handling, Custody, and Disposal

(UFP-QAPP Manual Section 3.3)

(EPA 2106-G-05 Manual Section 2.3.3)

Examples of field form (QAPP Appendix L), chain-of-custody (QAPP Appendix M), and sample label and custody seal (QAPP Appendix N) documentation are attached. SOPs for sample handling (identified in the table below) are located in QAPP Appendix H.

Sampling Organization: START

Laboratory: TBD

Method of sample delivery (shipper/carrier): Drop-off/FedEx

Number of days from reporting until sample disposal: 160 days

Activity	Organization and Title or Position of Person Responsible for the Activity	SOP Reference
Sample Labeling	START Field Personnel	QAPP Appendix H; SOP G-1 & G-3
Chain-of-Custody Form Completion	START Field Personnel	QAPP Appendix H; SOP G-8
Sample Packaging	START Field Personnel	QAPP Appendix H; SOP G-9
Shipping Coordination	START Field Personnel	QAPP Appendix H; SOP G-9
Sample Receipt, Inspection, & Log-in	Laboratory Sample Custodian	Laboratory SOP
Sample Custody and Storage	Laboratory Sample Custodian /Laboratory Analytical Personnel	Laboratory SOP
Sample Disposal	START Field Personnel/Laboratory Sample Custodian /Laboratory Analytical Personnel	QAPP Appendix H; SOP G-1 & G-3 Laboratory SOP

Supplies and consumables can be received at a START office, U.S. EPA Warehouse or at a site. When supplies are received at a START office or U.S. EPA Warehouse, the PM or PTL will sort the supplies according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before the supplies are accepted for use on a project. If the supplies do not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order. The item will then be returned to the vendor for replacement or repair.

Procedures for receiving supplies and consumables in the field are similar to those described above. Upon receipt, items will be inspected by the START PM or PTL against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook, and deficient items will be returned for immediate replacement.

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Worksheet 36 — Data Validation Procedures

(UFP-QAPP Manual Section 5.2.2)

(EPA 2106-G-05 Section 2.5.1)

Data Validator: START

Analytical Group/ Method	Data Deliverable Requirements	Analytical Specifications	Measurement Performance Criteria (MPC)	Percent of Data Packages to be Validated	Percent of Raw Data Reviewed	Percent of Results to be Recalculated	Validation Procedure	Validation Code ¹	Electronic Validation Program/ Version
VOCs SVOCs, Pesticides, pH, TAL Metals	SEDD Stage 1	QAPP Worksheet 28	QAPP Worksheets 11, 12, 19 & 30	100	0	0	U.S. EPA – Stage 1	S1VM	N/A

¹ Validation Codes are provided in QAPP Appendix M.

Validation will be performed on all laboratory analytical data unless a defined quantity or percentage of samples is identified by the U.S. EPA in the Technical Direction Document or during the project scoping meeting on a project-specific basis. Project validation criteria as per QAPP Worksheets 12, 15, 19 & 30, 28, and 36, and cited EPA SW-846 methodology will be used. WESTON-contracted laboratory data packages will be verified and validated using a Stage 1 validation, as described in the EPA *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (January 2009) (QAPP Appendix J) unless otherwise specified by the U.S. EPA WAM/COR during the development of the Data Quality Objectives (DQOs). Validation Qualifiers will be applied using the following hierarchy: Region 8 UFP-QAPP for Removal Actions and Emergency Responses; the site-specific SAP, and/or QAPP; *EPA National Functional Guidelines for Organic Data Review* (QAPP Appendix K); *EPA National Functional Guidelines for Inorganic Data Review* (QAPP Appendix L); EPA Publication SW-846; and the laboratory-specific SOP. Methods for which no data validation guidelines exist will be validated following the guidance deemed most appropriate by the data validator.

The data validator will receive all laboratory packages and analytical results electronically. Additionally, the validator will be required to submit final validation reports via PDF format and must provide an annotated laboratory analytical result EDD with applicable data validation qualifiers (QAPP Appendix M) identified in the site-specific SAP, and/or QAPP, and/or result value modifications. The Delegated QA Manager will use EPA document *Using Qualified Data to Document an Observed Release and Observed Contamination* (July 1996) to aid in determining the use of qualified data to document all observed release and observed contamination by chemical analysis under U.S. EPA's Hazard Ranking System (HRS). Approved data will be released by the Delegated QA Manager for reporting.

QAPP Worksheet 35 describes the issue resolution process and the individual responsible for conveying results to data users. For issues internal to the laboratory, the laboratory PM will be the responsible party for data resolution issues and will be responsible for conveying this

TDD 0003/1504-06

Worksheet 36 — Data Validation Procedures (Continued)

(UFP-QAPP Manual Section 5.2.2)

(EPA 2106-G-05 Section 2.5.1)

information to the Delegate QA Manager or delegated authority. For external laboratory data and quality issues, the Delegated QA Manager or delegated authority will provide issue resolution information and will be the responsible party for conveying this information to data users. For quality documents, reports, and field information, the Delegated QA Manager, delegated authority, or other persons identified in the table in QAPP Worksheet 35 will be responsible for issue resolutions of such items and will be the responsible party for conveying that information to data users.

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TABLES

TDD 0003/1504-06

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Table 1 - Sampling and Analysis Summary

Site: Barnum Orchard

WAM: Ted Lanzano

TDD: 0003/1508-03

Matrix	Site	Analytical Parameter	Analytical Method	Containers (Numbers, Size, and Type)	Preservation Requirements	Number of Sampling Locations	Number of Field Duplicates	Number of MS/MSDs	Number of Blanks (Trip, Field, Equip. Rinsate)	Total Number of Samples to Lab ¹	Preparation Holding Time
Soil	Barnum Orchard	Pesticides	EPA Methods 8081	One 8 oz. glass jar	Store @ < 4°C	9	1	1	0	10	14 days
		TAL Metals	EPA Methods 6010/6020	One 4-oz glass jar	Store @ < 4°C	9	1	1	0	10	6 Months
		pH	EPA Method 9045	One 4-oz glass jar	Store @ < 4°C	9	1	1	0	10	7 Days
		VOC/SVOC	EPA Method 8260/8270	One 4-oz glass jar	Store @ < 4°C	2-4	1	1	0	3-5	14 Days

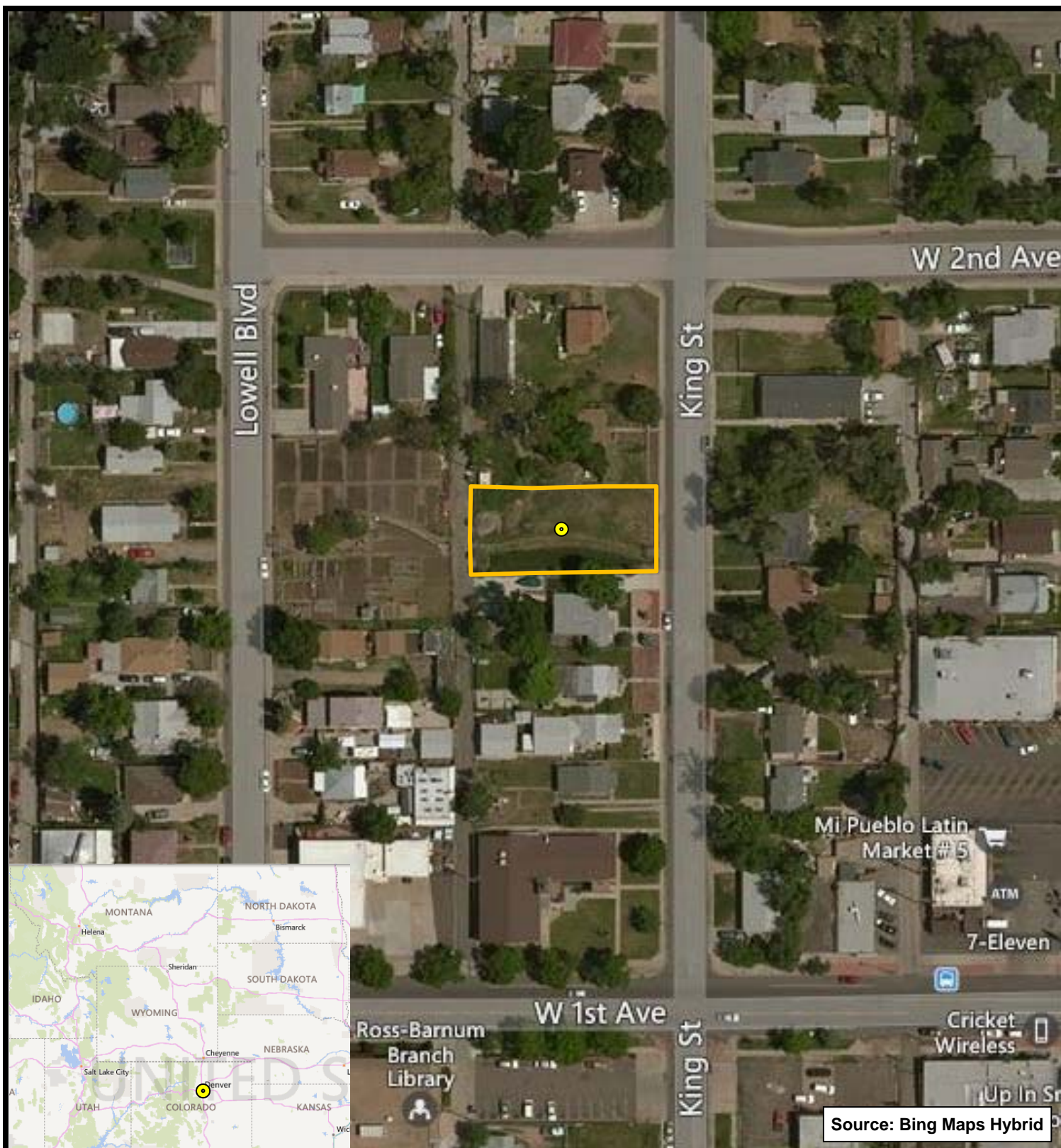
Notes:

¹Total number of samples to the laboratory does not include MS/MSD samples.

Equip. – Equipment



MS/MSD – Matrix Spike/Matrix Spike Duplicate

FIGURES



Source: Bing Maps Hybrid

Legend

-  Site Location
-  Orchard Boundary

0 50 100 Feet



Prepared for:
U.S. EPA Region 8



Contract No.:
EP-S8-13-01

TDD:
1508-03

TO:
0003

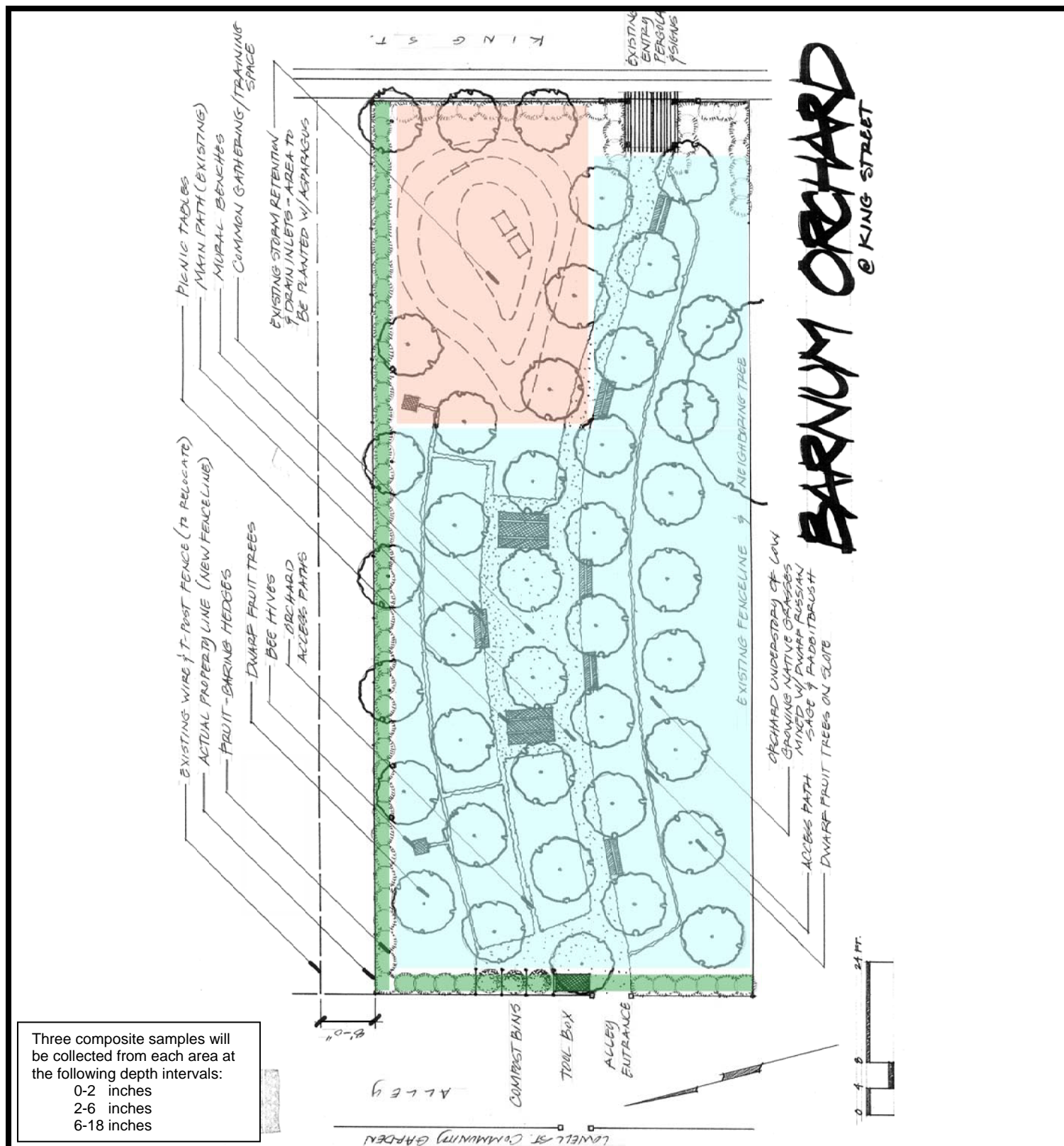


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FIGURE 1
SITE LOCATION MAP
DENVER URBAN GARDENS
BARNUM ORCHARD
CITY OF DENVER
DENVER COUNTY,
COLORADO

DATE: 8/28/2015



Prepared for:
U.S. EPA Region 8

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FIGURE 2
SAMPLE LOCATION MAP
BARNUM ORCHARD
CITY OF DENVER
DENVER COUNTY,
COLORADO

DATE: 8/28/2015

ATTACHMENTS



Targeted Brownfields Assessment (TBA) Application

EPA Region 8 accepts applications for environmental assessment assistance at brownfields properties on an ongoing basis. To request Region 8's technical assistance, please complete this application. The information provided will be evaluated to determine if the applicant and site meet the selection criteria for the TBA program. EPA will also evaluate whether funding is available to perform the requested assessment within the desired schedule. Applicants will be contacted promptly after this review. For more information on TBAs, please visit: www.epa.gov/region8/brownfields/tba.html

1. Applicant Information

Applicant Organization	Denver Urban Gardens
Contact Person and Title	Jessica Romer, Director of Horticulture
Street Address	1031 33 rd Street, Suite 100
City, State ZIP Code	Denver, CO 80205
Phone	303-292-9900
Fax	
Email Address	jessica@dug.org

2. Site Description and History

Site Name	Barnum Orchard
Address	101 King Street
Acreage	0.22 Acres
Lat/Long Coordinates	39.719221, -105.034138
Current Owner's Name	City of Denver Parks & Recreation
Current Owner's Address	201 W Colfax Ave, Dept. 6014, Denver, CO 80202

- A. Please provide a brief description of the property and the specific assessment(s) you wish to have performed (e.g., Phase I, II and/or cleanup planning):

We would like to have a Phase I and Phase II conducted for the purposes of determining if the site is suitable for the establishing of a community orchard.

- B. When you would like the assessment(s) to be conducted? What is the project timeline?

We would like to assessment to be conducted at the EPA's earliest convenience; the orchard is scheduled to begin construction in mid-August.

- C. Why would you like the assessment(s) conducted? (TBAs can be used to facilitate property acquisitions, meet EPA grant application requirements, characterize contamination for environmental cleanup, among other reasons.)

We would like the assessment to be conducted to determine the safety of the soil in which gardeners will be harvesting food for personal consumption and distribution to food banks.

- D. Describe the environmental conditions at the site, including potential contaminants and a summary of any known past environmental investigations. Describe the past uses of the site.

The site has been vacant since the City of Denver Parks and Recreation acquired it in the 1930's, and potentially beforehand as well, however that is not confirmed. The open channel of Weir Gulch ran right down the middle of the property. At some point, the open channel was completely covered/filled-in over a storm sewer pipe system. The fill dirt is from unknown origins.

- E. Is the applicant the property owner? **(Yes/No) NO.**
- F. If not, does the applicant have legal permission to enter the property to conduct the site assessment activities? **(Yes/No)** Note, applicant will be required to secure access. **YES.**
- G. Do you know how and when the contamination occurred? **(Yes/No)** If yes, describe. Note, applicants who are responsible for causing contamination are not eligible for assistance under this program.

Fill dirt is one potential source of contamination, however, we do not know when it was brought in.

- H. Describe any state or federal regulatory involvement at the site related to its environmental condition.

None to our knowledge.

- I. Is there an ongoing or planned state or federal enforcement action or order at the site? **(Yes/No) NO.**

If yes, please explain.

- a. Is the site on any state or federal environmental lists, such as the National Priorities Lists (NPL) or the Leaking Underground Storage Tanks (LUST) list? **(Yes/No)** If yes, please explain.
- b. If petroleum contamination is suspected, has the applicant worked with the State or EPA to determine eligibility*? **(Yes/No/NA)** If yes, please explain.

3. Property Reuse and Redevelopment

- A. Describe the anticipated reuse or redevelopment of the property.

Barnum Orchard will be a fruit orchard and berry garden for the Barnum neighborhood community. It is located adjacent to the Lowell Street Community Garden, a well-established food-producing DUG site that was established in 1997. The garden will be filled with apple, peach, plum, cherry and pear trees, with raspberries, strawberries, blackberries, and blueberries growing beneath the trees, all grown by volunteers and open to the community to eat and harvest. Produce not taken by the community will be harvested and donated to food banks. Future plans could include education workshops taught at the garden site by Master Gardeners to show how to grow similar trees and plants in home gardens.

- B. Describe any commitments in place to show this brownfields site will be cleaned up and redeveloped or reused. Please indicate potential or secured funding sources for cleanup and redevelopment.

Denver Urban Gardens is committed to working with the City of Denver Parks and Recreation to establish a community orchard that will serve nearby residents.

- C. Describe how site reuse/redevelopment will benefit the community (e.g., creation of jobs, green space, parks, sustainable/green redevelopment, a catalyst for further redevelopment in the area, etc). Privately owned sites must provide a substantial public benefit.

This community orchard will provide a much-needed source of nutritious food while fostering community relationships through growing and harvesting fruit. The Barnum neighborhood is a food desert, with one small grocery. The neighborhood is home to many newly arrived immigrants, primarily from Latin American, as well as many low-income families. Even if there were local sources for fresh fruit, it might be too expensive for many residents to purchase regularly.

- D. Will the property be sold or transferred to a different entity? If so, please describe.

No, but Denver Urban Gardens does hold a Use Agreement with Denver Parks and Recreation.

- E. Describe the roles of stakeholders in the project, e.g., community organizations, local government involvement, etc.

Community members are actively involved through the registered neighborhood organization, Concerned Citizens for Barnum, as well as through the Sustainable Barnum group, which is organized with the City of Denver's Sustainable Neighborhood Network. Residents are helping to solicit public comment on the orchard design, fundraise as well as volunteer to prepare the garden and plant trees and bushes when the site is ready.

- F. Describe efforts directed towards involving the community in site reuse planning activities.

Neighborhood residents will actively participate in building the community orchard as well as growing, cultivating and harvesting produce. Community residents attended a design review. Denver Urban Garden's Executive Director, a Landscape Architect by trade, incorporated changes based on their feedback to create a space more reflective of resident and neighborhood needs.

4. Additional Information

Please email any supporting documentation such as regional and site location maps, photographs, prior site assessment reports and historical environmental information, if available, to the email address provided below.

5. Contact Information

To submit your application or for questions, please contact Bill Rothenmeyer, TBA Program Manager:

Email: rothenmeyer.william@epa.gov

Phone: 303-312-6045

Fax: 303-312-6065

*The Brownfields Law outlines specific criteria by which petroleum sites may be eligible for brownfields funding. Briefly, these criteria are that the site must be of "relatively low risk," there can be no viable responsible party, the applicant cannot be potentially liable for cleaning up the site, and the site must not be subject to a Resource Conservation and Recovery Act (RCRA) corrective action order. If a party is identified as being responsible for the site and that party is financially viable, then the site is not eligible for brownfields grant funds. For more information, visit www.epa.gov/oswer/docs/grants/epa-oswer-oblr-11-05.pdf.